

**Amendment and Response**

Serial No.: 10/626,142

Confirmation No.: 9324

Filed: July 24, 2003

For: DENTAL WHITENING COMPOSITIONS AND METHODS

---

Page 2 of 20

**Amendments to the Claims**

This listing of claims replaces all prior versions, and listings, of claims in the above-identified application:

1. **(Currently Amended)** A dental whitening composition suitable for coating oral surfaces comprising:

a tooth whitening agent; and

a polymer comprising:

a repeating unit comprising N-isopropylacrylamide-a polar or polarizable group selected from the group consisting of hydroxy; thio; amido; cyclic ether; phosphine; amine; ammonium; oxyacid of C, S, P, or B; salt of an oxyacid of C, S, P, or B; thiooxyacid of C, S, P, or B; and salt of a thiooxyacid of C, S, P, or B; and

a repeating unit comprising a fluoride releasing group,

with the proviso that the polymer does not include pendant ethylenically unsaturated moieties,

~~wherein the repeating unit comprising the polar or polarizable group is different than the repeating unit comprising the fluoride releasing group;~~ and

wherein the composition comprises about 0.05% by weight to about 50% by weight of the tooth whitening agent, based on the total weight of the tooth whitening agent and the polymer.

2. **(Original)** The dental whitening composition of claim 1 wherein the polymer further comprises a repeating unit comprising a modulating group.

3. **(Original)** The dental whitening composition of claim 1 wherein the tooth whitening agent is selected from the group consisting of a hypochlorite, an organic peroxide, an inorganic peroxide, a hydroperoxide, hydrogen peroxide, a peracid, carbamide peroxide, and combinations thereof.

4. (Canceled)

5. (Canceled)

6. (Original) The dental whitening composition of claim 1 wherein the repeating unit comprising the fluoride releasing group comprises tetrafluoroborate anions.

7. (Original) The dental whitening composition of claim 1 wherein the repeating unit comprising the fluoride releasing group is trimethylammoniummethyl methacrylate tetrafluoroborate.

8. (Currently Amended) A dental whitening composition suitable for coating oral surfaces comprising:

greater than 10% by weight of a tooth whitening agent, based on the total weight of the dental whitening composition; and

a polymer comprising:

a repeating unit comprising N-isopropylacrylamide-a polar or polarizable group selected from the group consisting of hydroxy; thio; amido; cyclic ether; phosphine; amine; ammonium; oxyacid of C, S, P, or B; salt of an oxyacid of C, S, P, or B; thiooxyacid of C, S, P, or B; and salt of a thiooxyacid of C, S, P, or B; and

a repeating unit comprising a fluoride releasing group,

wherein the repeating unit comprising the polar or polarizable group is different than the repeating unit comprising the fluoride releasing group.

9. (Original) The dental whitening composition of claim 8 wherein the polymer further comprises a repeating unit comprising a modulating group.

**Amendment and Response**

Serial No.: 10/626,142

Confirmation No.: 9324

Filed: July 24, 2003

For: DENTAL WHITENING COMPOSITIONS AND METHODS

---

Page 4 of 20

10. **(Original)** The dental whitening composition of claim 8 wherein the tooth whitening agent is selected from the group consisting of a hypochlorite, a organic peroxide, an inorganic peroxide, a hydroperoxide, hydrogen peroxide, a peracid, carbamide peroxide, and combinations thereof.

11. **(Canceled)**

12. **(Original)** The dental whitening composition of claim 8 wherein the repeating unit comprising the fluoride releasing group comprises tetrafluoroborate anions.

13. **(Original)** The dental whitening composition of claim 8 wherein the repeating unit comprising the fluoride releasing group is trimethylammoniummethyl methacrylate tetrafluoroborate.

14. **(Original)** The dental whitening composition of claim 8 wherein the polymer further comprises a reactive group.

15. **(Currently Amended)** A dental whitening composition suitable for coating oral surfaces comprising:

a tooth whitening agent; and

a polymer comprising:

a repeating unit comprising N-isopropylacrylamide a polar or polarizable group selected from the group consisting of hydroxy; thio; amido; cyclic ether; phosphine; amine; ammonium; oxyacid of C, S, P, or B; salt of an oxyacid of C, S, P, or B; thiooxyacid of C, S, P, or B; and salt of a thiooxyacid of C, S, P, or B; and

a repeating unit comprising a fluoride releasing group,

with the proviso that the dental whitening composition does not include hydrogen peroxide,

wherein the repeating unit comprising the polar or polarizable group is different than the repeating unit comprising the fluoride releasing group, and

wherein the composition comprises about 0.05% by weight to about 50% by weight of the tooth whitening agent, based on the total weight of the tooth whitening agent and the polymer.

16. (Original) The dental whitening composition of claim 15 wherein the polymer further comprises a repeating unit comprising a modulating group.

17. (Original) The dental whitening composition of claim 15 wherein the tooth whitening agent is selected from the group consisting of a hypochlorite, an organic peroxide, an inorganic peroxide, a hydroperoxide, a peracid, carbamide peroxide, and combinations thereof.

18. (Canceled)

19. (Canceled)

20. (Original) The dental whitening composition of claim 15 wherein the repeating unit comprising the fluoride releasing group comprises tetrafluoroborate anions.

21. (Original) The dental whitening composition of claim 15 wherein the repeating unit comprising the fluoride releasing group is trimethylammoniummethyl methacrylate tetrafluoroborate.

22. (Original) The dental whitening composition of claim 15 wherein the polymer further comprises a reactive group.

**Amendment and Response**

Serial No.: 10/626,142

Confirmation No.: 9324

Filed: July 24, 2003

For: DENTAL WHITENING COMPOSITIONS AND METHODS

---

Page 6 of 20

23. **(Currently Amended)** A dental whitening composition suitable for coating oral surfaces comprising:

a tooth whitening agent; and

a polymer comprising:

a repeating unit comprising N-isopropylacrylamide a polar or polarizable group selected from the group consisting of hydroxy; thio; amido; cyclic ether; phosphine; amine; ammonium; oxyacid of C, S, P, or B; salt of an oxyacid of C, S, P, or B; thiooxyacid of C, S, P, or B; and salt of a thiooxyacid of C, S, P, or B; and

a repeating unit comprising a fluoride releasing group comprising tetrafluoroborate anions,

wherein the repeating unit comprising the polar or polarizable group is different than the repeating unit comprising the fluoride releasing group; and

wherein the composition comprises about 0.05% by weight to about 50% by weight of the tooth whitening agent, based on the total weight of the tooth whitening agent and the polymer.

24. **(Original)** The dental whitening composition of claim 23 wherein the polymer further comprises a repeating unit comprising a modulating group.

25. **(Original)** The dental whitening composition of claim 23 wherein the tooth whitening agent is selected from the group consisting of a hypochlorite, an organic peroxide, an inorganic peroxide, a hydroperoxide, hydrogen peroxide, a peracid, carbamide peroxide, and combinations thereof.

26. **(Canceled)**

27. **(Canceled)**

**Amendment and Response**

Serial No.: 10/626,142

Confirmation No.: 9324

Filed: July 24, 2003

For: DENTAL WHITENING COMPOSITIONS AND METHODS

---

Page 7 of 20

28. **(Original)** The dental whitening composition of claim 23 wherein the repeating unit comprising the fluoride releasing group is trimethylammoniummethyl methacrylate tetrafluoroborate.

29. **(Original)** The dental whitening composition of claim 23 wherein the polymer further comprises a reactive group.

30. **(Currently Amended)** A dental whitening composition suitable for coating oral surfaces comprising:

a tooth whitening agent; and

a polymer comprising:

a repeating unit comprising N-isopropylacrylamide-a polar or polarizable group selected from the group consisting of hydroxy; thio; amido; cyclic ether; phosphine; amine; ammonium; oxyacid of C, S, P, or B; salt of an oxyacid of C, S, P, or B; thiooxyacid of C, S, P, or B; and salt of a thiooxyacid of C, S, P, or B;

a repeating unit comprising a fluoride releasing group; and

a repeating unit comprising a group selected from the group consisting of a hydrophobic hydrocarbon group, a graft polysiloxane chain, a hydrophobic fluorine-containing group, and combinations thereof,

with the proviso that the polymer does not include pendant ethylenically unsaturated moieties,

wherein the repeating unit comprising the polar or polarizable group is different than the repeating unit comprising the fluoride releasing group; and

wherein the composition comprises about 0.05% by weight to about 50% by weight of the tooth whitening agent, based on the total weight of the tooth whitening agent and the polymer.

- 
31. **(Original)** The dental whitening composition of claim 30 wherein the polymer further comprises a repeating unit comprising a modulating group.
32. **(Original)** The dental whitening composition of claim 30 wherein the tooth whitening agent is selected from the group consisting of a hypochlorite, an organic peroxide, an inorganic peroxide, a hydroperoxide, hydrogen peroxide, a peracid, carbamide peroxide, and combinations thereof.
33. **(Canceled)**
34. **(Canceled)**
35. **(Original)** The dental whitening composition of claim 30 wherein the repeating unit comprising the hydrophobic hydrocarbon group is octadecylacrylate.
36. **(Original)** The dental whitening composition of claim 30 wherein the repeating unit comprising the hydrophobic fluorine-containing group is selected from the group consisting of 2-(methyl(nonafluorobutyl)sulfonyl)amino)ethyl acrylate, 2-(methyl(nonafluorobutyl)sulfonyl)amino)ethyl methacrylate, and combinations thereof.
37. **(Currently Amended)** A dental whitening composition suitable for coating oral surfaces comprising:  
greater than 10% by weight of a tooth whitening agent, based on the total weight of the dental whitening composition; and  
a polymer comprising:  
a repeating unit comprising N-isopropylacrylamide-a-polar-or-polarizable group  
selected from the group consisting of hydroxy; thio; amido; cyclic ether; phosphine; amine;

**Amendment and Response**

Page 9 of 20

Serial No.: 10/626,142

Confirmation No.: 9324

Filed: July 24, 2003

For: DENTAL WHITENING COMPOSITIONS AND METHODS

---

ammonium; oxyacid of C, S, P, or B; salt of an oxyacid of C, S, P, or B; thiooxyacid of C, S, P, or B; and salt of a thiooxyacid of C, S, P, or B;

a repeating unit comprising a fluoride releasing group; and

a repeating unit comprising a group selected from the group consisting of a hydrophobic hydrocarbon group, a graft polysiloxane chain, a hydrophobic fluorine-containing group, and combinations thereof;

wherein the repeating unit comprising the polar or polarizable group is different than the repeating unit comprising the fluoride releasing group.

38. **(Original)** The dental whitening composition of claim 37 wherein the polymer further comprises a repeating unit comprising a modulating group.

39. **(Original)** The dental whitening composition of claim 37 wherein the tooth whitening agent is selected from the group consisting of a hypochlorite, an organic peroxide, an inorganic peroxide, a hydroperoxide, hydrogen peroxide, a peracid, carbamide peroxide, and combinations thereof.

40. **(Original)** The dental whitening composition of claim 37 wherein the polymer further comprises a reactive group.

41. **(Currently Amended)** A dental whitening composition suitable for coating oral surfaces comprising:

a tooth whitening agent; and

a polymer comprising:

a repeating unit comprising N-isopropylacrylamide a polar or polarizable group selected from the group consisting of hydroxy; thio; amido; cyclic ether; phosphine; amine; ammonium; oxyacid of C, S, P, or B; salt of an oxyacid of C, S, P, or B; thiooxyacid of C, S, P, or B; and salt of a thiooxyacid of C, S, P, or B;

**Amendment and Response**

Serial No.: 10/626,142

Confirmation No.: 9324

Filed: July 24, 2003

For: DENTAL WHITENING COMPOSITIONS AND METHODS

---

Page 10 of 20

a repeating unit comprising a fluoride releasing group; and

a repeating unit comprising a group selected from the group consisting of a hydrophobic hydrocarbon group, a graft polysiloxane chain, a hydrophobic fluorine-containing group, and combinations thereof,

~~wherein the repeating unit comprising the polar or polarizable group is different than the repeating unit comprising the fluoride releasing group, and~~

with the proviso that the dental whitening composition does not include hydrogen peroxide, and

wherein the composition comprises about 0.05% by weight to about 50% by weight of the tooth whitening agent, based on the total weight of the tooth whitening agent and the polymer.

42. **(Original)** The dental whitening composition of claim 41 wherein the polymer further comprises a repeating unit comprising a modulating group.

43. **(Original)** The dental whitening composition of claim 41 wherein the tooth whitening agent is selected from the group consisting of a hypochlorite, an organic peroxide, an inorganic peroxide, a hydroperoxide, a peracid, carbamide peroxide, and combinations thereof.

44. **(Canceled)**

45. **(Original)** The dental whitening composition of claim 41 wherein the polymer further comprises a reactive group.

46. **(Currently Amended)** A coating on hard tissue surfaces or surfaces of the oral environment comprising:

a tooth whitening agent; and

a polymer comprising:

a repeating unit comprising N-isopropylacrylamide a polar or polarizable group selected from the group consisting of hydroxy; thio; amide; cyclic ether; phosphine; amine; ammonium; oxyacid of C, S, P, or B; salt of an oxyacid of C, S, P, or B; thiooxyacid of C, S, P, or B; and salt of a thiooxyacid of C, S, P, or B; and

a repeating unit comprising a fluoride releasing group,

with the proviso that the polymer does not include pendant ethylenically unsaturated moieties,

wherein the repeating unit comprising the polar or polarizable group is different than the repeating unit comprising the fluoride releasing group; and

wherein the coating comprises about 0.05% by weight to about 50% by weight of the tooth whitening agent, based on the total weight of the tooth whitening agent and the polymer.

**47. (Currently Amended)** A coating on hard tissue surfaces or surfaces of the oral environment comprising:

greater than 10% by weight of a tooth whitening agent, based on the total weight of the coating; and

a polymer comprising:

a repeating unit comprising N-isopropylacrylamide a polar or polarizable group selected from the group consisting of hydroxy; thio; amido; cyclic ether; phosphine; amine; ammonium; oxyacid of C, S, P, or B; salt of an oxyacid of C, S, P, or B; thiooxyacid of C, S, P, or B; and salt of a thiooxyacid of C, S, P, or B; and

a repeating unit comprising a fluoride releasing group;

wherein the repeating unit comprising the polar or polarizable group is different than the repeating unit comprising the fluoride releasing group.

**48. (Currently Amended)** A coating on hard tissue surfaces or surfaces of the oral environment comprising:

a tooth whitening agent; and

**Amendment and Response**

Serial No.: 10/626,142

Confirmation No.: 9324

Filed: July 24, 2003

For: DENTAL WHITENING COMPOSITIONS AND METHODS

---

Page 12 of 20

a polymer comprising:

a repeating unit comprising N-isopropylacrylamide a polar or polarizable group selected from the group consisting of hydroxy; thio; amido; cyclic ether; phosphine; amine; ammonium; oxyacid of C, S, P, or B; salt of an oxyacid of C, S, P, or B; thiooxyacid of C, S, P, or B; and salt of a thiooxyacid of C, S, P, or B; and

a repeating unit comprising a fluoride releasing group,

wherein the repeating unit comprising the polar or polarizable group is different than the repeating unit comprising the fluoride releasing group; and

with the proviso that the dental whitening composition does not include hydrogen peroxide, and

wherein the coating comprises about 0.05% by weight to about 50% by weight of the tooth whitening agent, based on the total weight of the tooth whitening agent and the polymer.

**49. (Currently Amended)** A coating on hard tissue surfaces or surfaces of the oral environment comprising:

a tooth whitening agent; and

a polymer comprising:

a repeating unit comprising N-isopropylacrylamide a polar or polarizable group selected from the group consisting of hydroxy; thio; amido; cyclic ether; phosphine; amine; ammonium; oxyacid of C, S, P, or B; salt of an oxyacid of C, S, P, or B; thiooxyacid of C, S, P, or B; and salt of a thiooxyacid of C, S, P, or B; and

a repeating unit comprising a fluoride releasing group comprising tetrafluoroborate anions,

wherein the repeating unit comprising the polar or polarizable group is different than the repeating unit comprising the fluoride releasing group; and

wherein the coating comprises about 0.05% by weight to about 50% by weight of the tooth whitening agent, based on the total weight of the tooth whitening agent and the polymer.

**Amendment and Response**

Page 13 of 20

Serial No.: 10/626,142

Confirmation No.: 9324

Filed: July 24, 2003

For: DENTAL WHITENING COMPOSITIONS AND METHODS

---

50. **(Currently Amended)** A coating on hard tissue surfaces or surfaces of the oral environment comprising:

a tooth whitening agent; and

a polymer comprising:

a repeating unit comprising N-isopropylacrylamide a polar or polarizable group selected from the group consisting of hydroxy; thio; amido; cyclic ether; phosphine; amine; ammonium; oxyacid of C, S, P, or B; salt of an oxyacid of C, S, P, or B; thiooxyacid of C, S, P, or B; and salt of a thiooxyacid of C, S, P, or B;

a repeating unit comprising a fluoride releasing group; and

a repeating unit comprising a group selected from the group consisting of a hydrophobic hydrocarbon group, a graft polysiloxane chain, a hydrophobic fluorine-containing group, and combinations thereof,

with the proviso that the polymer does not include pendant ethylenically unsaturated moieties,

wherein the repeating unit comprising the polar or polarizable group is different than the repeating unit comprising the fluoride releasing group; and

wherein the coating comprises about 0.05% by weight to about 50% by weight of the tooth whitening agent, based on the total weight of the tooth whitening agent and the polymer.

51. **(Currently Amended)** A coating on hard tissue surfaces or surfaces of the oral environment comprising:

greater than 10% by weight of a tooth whitening agent, based on the total weight of the coating; and

a polymer comprising:

a repeating unit comprising N-isopropylacrylamide a polar or polarizable group selected from the group consisting of hydroxy; thio; amido; cyclic ether; phosphine; amine; ammonium; oxyacid of C, S, P, or B; salt of an oxyacid of C, S, P, or B; thiooxyacid of C, S, P, or B; and salt of a thiooxyacid of C, S, P, or B;

**Amendment and Response**

Serial No.: 10/626,142

Confirmation No.: 9324

Filed: July 24, 2003

For: DENTAL WHITENING COMPOSITIONS AND METHODS

---

Page 14 of 20

a repeating unit comprising a fluoride releasing group; and  
a repeating unit comprising a group selected from the group consisting of a hydrophobic hydrocarbon group, a graft polysiloxane chain, a hydrophobic fluorine-containing group, and combinations thereof;

~~wherein the repeating unit comprising the polar or polarizable group is different than the repeating unit comprising the fluoride releasing group.~~

**52. (Currently Amended)** A coating on hard tissue surfaces or surfaces of the oral environment comprising:

a tooth whitening agent; and  
a polymer comprising:  
~~a repeating unit comprising N-isopropylacrylamide-a polar or polarizable group selected from the group consisting of hydroxy; thio; amido; cyclic ether; phosphine; amine; ammonium; oxyacid of C, S, P, or B; salt of an oxyacid of C, S, P, or B; thiooxyacid of C, S, P, or B; and salt of a thiooxyacid of C, S, P, or B;~~

a repeating unit comprising a fluoride releasing group; and  
a repeating unit comprising a group selected from the group consisting of a hydrophobic hydrocarbon group, a graft polysiloxane chain, a hydrophobic fluorine-containing group, and combinations thereof;

~~wherein the repeating unit comprising the polar or polarizable group is different than the repeating unit comprising the fluoride releasing group, and~~

with the proviso that the dental whitening composition does not include hydrogen peroxide, and

wherein the coating comprises about 0.05% by weight to about 50% by weight of the tooth whitening agent, based on the total weight of the tooth whitening agent and the polymer.

**53. (Original)** A method of whitening teeth comprising applying a dental whitening composition according to claim 1 to a hard tissue surface or a surface of the oral environment.

54. **(Original)** The method of claim 53 wherein applying the composition is selected from the group consisting of painting the composition, brushing the composition, syringing the composition, misting the composition, spraying the composition, applying a substrate having the composition thereon, and combinations thereof.

55. **(Original)** The method of claim 53 wherein the composition is in a form selected from the group consisting of a dispersion, a suspension, an emulsion, a solution, and combinations thereof.

56. **(Original)** The method of claim 53 wherein the composition is an aqueous composition.

57. **(Original)** A method of whitening teeth comprising applying a dental whitening composition according to claim 8 to a hard tissue surface or a surface of the oral environment.

58. **(Original)** The method of claim 57 wherein applying the composition is selected from the group consisting of painting the composition, brushing the composition, syringing the composition, misting the composition, spraying the composition, applying a substrate having the composition thereon, and combinations thereof.

59. **(Original)** The method of claim 57 wherein the composition is in a form selected from the group consisting of a dispersion, a suspension, an emulsion, a solution, and combinations thereof.

60. **(Original)** The method of claim 57 wherein the composition is an aqueous composition.

61. **(Original)** A method of whitening teeth comprising applying a dental whitening composition according to claim 15 to a hard tissue surface or a surface of the oral environment.

62. **(Original)** The method of claim 61 wherein applying the composition is selected from the group consisting of painting the composition, brushing the composition, syringing the composition, misting the composition, spraying the composition, applying a substrate having the composition thereon, and combinations thereof.

63. **(Original)** The method of claim 61 wherein the composition is in a form selected from the group consisting of a dispersion, a suspension, an emulsion, a solution, and combinations thereof.

64. **(Original)** The method of claim 61 wherein the composition is an aqueous composition.

65. **(Original)** A method of whitening teeth comprising applying a dental whitening composition according to claim 23 to a hard tissue surface or a surface of the oral environment.

66. **(Original)** The method of claim 65 wherein applying the composition is selected from the group consisting of painting the composition, brushing the composition, syringing the composition, misting the composition, spraying the composition, applying a substrate having the composition thereon, and combinations thereof.

67. **(Original)** The method of claim 65 wherein the composition is in a form selected from the group consisting of a dispersion, a suspension, an emulsion, a solution, and combinations thereof.

68. **(Original)** The method of claim 65 wherein the composition is an aqueous composition.

69. **(Original)** A method of whitening teeth comprising applying a dental whitening composition according to claim 30 to a hard tissue surface or a surface of the oral environment.

70. **(Original)** The method of claim 69 wherein applying the composition is selected from the group consisting of painting the composition, brushing the composition, syringing the composition, misting the composition, spraying the composition, applying a substrate having the composition thereon, and combinations thereof.
71. **(Original)** The method of claim 69 wherein the composition is in a form selected from the group consisting of a dispersion, a suspension, an emulsion, a solution, and combinations thereof.
72. **(Original)** The method of claim 69 wherein the composition is an aqueous composition.
73. **(Original)** A method of whitening teeth comprising applying a dental whitening composition according to claim 37 to a hard tissue surface or a surface of the oral environment.
74. **(Original)** The method of claim 73 wherein applying the composition is selected from the group consisting of painting the composition, brushing the composition, syringing the composition, misting the composition, spraying the composition, applying a substrate having the composition thereon, and combinations thereof.
75. **(Original)** The method of claim 73 wherein the composition is in a form selected from the group consisting of a dispersion, a suspension, an emulsion, a solution, and combinations thereof.
76. **(Original)** The method of claim 73 wherein the composition is an aqueous composition.
77. **(Original)** A method of whitening teeth comprising applying a dental whitening composition according to claim 41 to a hard tissue surface or a surface of the oral environment.

Serial No.: 10/626,142

Confirmation No.: 9324

Filed: July 24, 2003

For: DENTAL WHITENING COMPOSITIONS AND METHODS

---

78. **(Original)** The method of claim 77 wherein applying the composition is selected from the group consisting of painting the composition, brushing the composition, syringing the composition, misting the composition, spraying the composition, applying a substrate having the composition thereon, and combinations thereof.

79. **(Original)** The method of claim 77 wherein the composition is in a form selected from the group consisting of a dispersion, a suspension, an emulsion, a solution, and combinations thereof.

80. **(Original)** The method of claim 77 wherein the composition is an aqueous composition.